WHAT IS CLAIMED IS

1. An ~~image processing device, comprising:~~

a filtering unit which filters an input image with variable frequency characteristics;

an edge detection unit which detects magnitudes of edges appearing in the input image; and

a degree-of-white-background-likeliness detection unit which detects degrees of white-background likeliness in respect of local areas of the input image, wherein said filtering unit changes the variable frequency characteristics in response to the magnitudes of edges and to the degrees of white-background likeliness.

2. The image processing device as claimed in claim 1, wherein said degree-of-white-background-likeliness detection unit marks white backgrounds and boundary areas adjacent to the white backgrounds as

white-background areas and marks other areas as non-white-background areas.

3. The image processing device as claimed in claim 1, further comprising an edge-magnitude-conversion unit which converts the magnitudes of edges according to the degrees of white-background likeliness, wherein said filtering unit changes the variable frequency characteristics in response to the converted magnitudes of edges.

4. The image processing device as claimed in claim 3, wherein said edge-magnitude-conversion unit converts the magnitudes of edges such that the variable frequency characteristics enhances high frequency components to an increased degree at edge areas as the degrees of white-background likeliness increases.

5. The image processing device as claimed in claim 3, wherein said filtering unit enhances high frequency characteristics of the variable frequency characteristics at edge areas according to the converted magnitudes of edges, the enhancement of the high frequency characteristics being made relative to the variable frequency characteristics applied to non-edge areas.

6. The image processing device as claimed in claim 5, wherein said filtering unit includes:

a first filter which has a frequency characteristic that is space invariant over all areas of the input image; and

a second filter which has a high-frequency-enhancement characteristic, and has an output level thereof being adjusted in response to the converted magnitudes of edges.

7. The image processing device as claimed in claim 6, wherein the frequency characteristic of said first filter enhances edges while suppressing generation of moiré in mesh-dot image areas.

8. The image processing device as claimed in claim 6, wherein said first filter has a band-frequency-enhancement characteristic.

9. A method of processing an image, comprising the steps of:

detecting magnitudes of edges appearing in an input image;

detecting degrees of white-background likeliness in respect of local areas of the input image; and

applying filtering processes to the input image while changing frequency characteristics of the filtering processes in response to the magnitudes of

edges and the degrees of white-background likeliness.

10. The method as claimed in claim 9, wherein the step of detecting degrees of white-background likeliness marks white backgrounds and boundary areas adjacent to the white backgrounds as white-background areas, and marks other areas as non-white-background areas.

11. An image processing device, comprising:

a degree-of-white-background-likeliness detection unit which detects degrees of white-background likeliness in respect of local areas of an input multi-level image; and

a gray-level conversion unit which converts gray levels of the input multi-level image according to conversion characteristics that change in response to the degrees of white-background likeliness.

~~12. The~~ image processing device as claimed in claim 11, wherein said gray-level conversion unit includes:

a plurality of gray-level conversion units converting the gray levels of the input multi-level image according to respective gray-level-conversion characteristics; and

a selection unit which selects one of said plurality of gray-level conversion units in response to the degrees of white-background likeliness.

13. The image processing unit as claimed in claim 11, wherein said degree-of-white-background-likeliness detection unit is an area detection unit that marks white backgrounds and boundary areas adjacent to the white backgrounds as white-background areas, and marks other areas as non-white-background areas.

14. The image processing unit as claimed in

claim 13, wherein said area detection unit includes:

a thresholding unit which carries out thresholding of the input multi-level image to generate a binary image;

a white-background-area detection unit which counts white pixels in a given area of the binary image, and marks the given area of the binary image as a white-background area or a non-white-background area in response to the count; and

an expansion unit which spatially expands the white-background area by a predetermined number of pixels in all directions when the white-background area is detected by the white-background-area detection unit.

15. The image processing device as claimed in claim 14, wherein the predetermined number of pixels and an image resolution (dpi) of the input multi-level image are related as:

150 < (the image resolution (dpi) / the predetermined number of pixels) < 400.

~~16. The image processing device as claimed in~~ claim 13, wherein a gray-level conversion characteristic applied to the white-background areas converts an input gray level of the input multi-level image into a greater value than a gray-level conversion characteristic applied to the non-white-background areas in a range of input gray levels above a predetermined gray level.

17. The image processing device as claimed in claim 13, wherein a gray-level conversion characteristic applied to the white-background areas converts an input gray level of the input multi-level image into a value greater by a constant amount than a value output by a gray-level conversion characteristic applied to the non-white-background areas in a range of input gray levels above a predetermined gray level.

18. The image processing device as claimed in

claim 13, wherein a gray-level conversion characteristic applied to the white-background areas converts an input gray level of the input multi-level image into a maximum gray level in a range of input gray levels above a predetermined gray level.

19. The image processing device as claimed in claim 11, wherein a gray-level conversion characteristic applied to the white-background areas is adjustable by user operation.

20. The image processing device as claimed in claim 11, wherein the input multi-level image supplied to said degree-of-white-background-likeliness detection unit is an image obtained after a filtering process that has such a frequency characteristic as to smooth isolated dots.

21. The image processing device as claimed in claim 11, wherein the input multi-level image supplied to said degree-of-white-background-likeliness detection unit is an image obtained after size-change processing.

22. The image processing device as claimed in claim 13, further comprising:

a block-generation unit which divides an area-detected image into a plurality of blocks when the area-detected image is output from said area detection unit;

an area-pixel counting unit which counts pixels marked as the white-background areas within each of the blocks; and

a check unit which marks each of the blocks either as a white-background block or as a non-white-background block in response to the counts obtained by said area-pixel counting unit.

23. The image processing device as claimed in claim 22, wherein the blocks are square shaped.

24. An image processing device, comprising:

a plurality of gray-level conversion units converting gray levels of an input multi-level image according to respective gray-level-conversion characteristics;

an area detection unit which detects boundary areas adjacent to white backgrounds in the input multi-level image; and

a selection unit which selects one of said plurality of gray-level conversion units in response to detection results of said area detection unit.

25. The image processing device as claimed in claim 24, wherein said area detection unit includes:

a thresholding unit which carries out thresholding of the input multi-level image to generate

a binary image;

a white-background-area detection unit which counts white pixels in a given area of the binary image, and marks the given area of the binary image as a white-background area or a non-white-background area in response to the count;

an expansion unit which spatially expands the white-background area detected by the white-background-area detection unit; and

an logical AND unit which obtains a logical product of the binary image and an image in which white-background areas are expanded by said expansion unit, thereby outputting a binary image indicative of the boundary areas.

26. The image processing device as claimed in claim 24, wherein a gray-level conversion characteristic applied to the boundary areas converts an input gray level of the input multi-level image into a greater value than a gray-level conversion characteristic applied to areas other than the boundary areas in a range of input gray levels above a predetermined gray

level.

27. A method of processing an image, comprising the steps of:

detecting degrees of white-background likeliness in respect of local areas of an input multi-level image; and

converting gray levels of the input multi-level image according to gray-level conversion characteristics varying depending on the degrees of white-background likeliness.

28. The method as claimed in claim 27, wherein the step of converting gray levels of the input multi-level image includes the steps of:

converting the gray levels of the input multi-level image according to different gray-level-conversion characteristics; and

selecting one of outputs of the different

gray-level conversion characteristics in response to the degrees of white-background likeliness.

29. The method as claimed in claim 27, wherein the step of detecting degrees of white-background likeliness marks white backgrounds and boundary areas adjacent to the white backgrounds as white-background areas, and marks other areas as non-white-background areas.

30. An image processing system, comprising:

an image input unit which acquires an image;

an edge detection unit which detects magnitudes of edges appearing in the acquired image;

a degree-of-white-background-likeliness detection unit which detects degrees of white-background likeliness in respect of local areas of the acquired image;

a filtering unit which applies filtering

processes to the acquired image while changing frequency characteristics of the filtering processes in response to the magnitudes of edges and the degrees of white-background likeliness; and

an image output unit which reproduces the filtered image.

31. The image processing system as claimed in claim 30, wherein said degrees-of-white-background-likeliness detection unit marks white backgrounds and boundary areas adjacent to the white backgrounds as white-background areas, and marks other areas as non-white-background areas.

32. An image processing system, comprising:

an image input unit which acquires an image;

a degree-of-white-background-likeliness detection unit which detects degrees of white-background likeliness in respect of local areas of the acquired

image;

a gray-level conversion unit which converts gray levels of the acquired image according to gray-level conversion characteristics varying depending on the degrees of white-background likeliness; and

an image output unit which reproduces the gray-level converted image.

33. The image processing system as claimed in claim 32, wherein the gray-level conversion unit includes:

a unit which converts the gray levels of the input multi-level image according to different gray-level-conversion characteristics; and

a unit which selects one of outputs of the different gray-level conversion characteristics in response to the degrees of white-background likeliness.

34. The image processing system as claimed in

claim 33, wherein said degrees-of-white-background-likeliness detection unit marks white backgrounds and boundary areas adjacent to the white backgrounds as white-background areas, and marks other areas as non-white-background areas.